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FAULT DIAGNOSIS OF SELF ALIGN ROLLER BEARING AT VARIOUS SPEED USING FREQUENCY DOMAIN

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ABSTRACT

To minimize the faults of the self-align roller bearing in the different types of machines in the workshops or industries before any kind of a huge failure, it's mandatory to monitor them. The main objective of this experimentation is to detect the defective bearing and differentiate with the healthy bearing. The two processing techniques which is used are frequency domain and time domain which helps to find their response of defective one and the healthy one and differentiation between them. The perimeter which is followed are Velocity, Mach, Displacement Spectrum. The self-align roller bearing used is with the number 1205. The speed of rotation input parameters are changed. 500, 750, 1000. The comparison between the fresh and the used one using the time domain and the frequency audit of the vibration signals represent that the healthy bearing gives more stable and stationary signals as compared to unhealthy bearing.

KEYWORDS: Overall Velocity & Mach Spectrum

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Original Article

INTRODUCTION

Most of the industries in this competitive world depend upon the roller bearing to make effortless work done in different parts of the mechanism in the machines. The machine efficiency is based on the condition of the bearings. The main object of the bearing is to reduce the friction between the mating parts as much as possible to give higher efficiency. So the maintenance of the bearing is necessary. The parameters of maintenance are surveillance temperature, lubrication, vibration, wear, noise etc. The maximum occurring factor in unhealthy operation of machine is vibrating the rolling element that is cylindrical roller. Furthermore different types of cracks, wear and spalls of the inner and the outer race of the roller bearing which causes vibration in the machine [1]. It is mandatory to check and cross verify the functioning of the bearing which is used in the machine without any breakout. To measure the vibration in this study, depends on the machine work without affecting it. The piezoelectric accelerometer is a device which is used to employ the piezoelectric effect of certain materials to measure dynamic changes in mechanical variables. It also measures vibration velocity, power spectrum and shock pulse during the whole process of bearing [2]. The difference of both healthy and unhealthy bearing is detected by these faults. In this monitoring system handy data, vibration analyzer and intelligent online system these are some basic element for measurement [3].

The self-align roller bearing is been used in this study. As it has high performance at high speed and light to medium axial load self-align roller bearing is being used widely in the industry. The inner and the outer race of roller bearings having circular arc with radius comparatively bigger than the radius of the rollers of the bearing [4]. It takes the advantage of the silent operation startup torque. Pressed steel which is to be considered as made cage. This experiment's main objective is to taper the inner ring from the shaft side and the adapter sleeve is fitted with it. On vibration, signals are influence by the effect produced by speed. Bearing type, rotor weight speed are the input parameters [5-6].

Figure 1

EXPERIMENTAL SETUP

The experimental setup is shown in the figure given below. The major components are rotor mass, vibration scanner, computer, bearing house piezoelectric transducer. Initially all the data collected is uploaded to the vibration scanner instrument through a cable. In other terms displacement spectrum and overall velocity of the bearing housing merges all the vibration signal. The vibration scanner is a device which convert the analog signal to digital signal by means of ADC which is mounted on the vib scanner. The date is transferred through the data cable to the computer to generate the result. Two self align roller bearing is considered, one is new and well lubricated and the other is old and used bearing from the machine. On the old bearing defects like Cracks, pits, spalls, on outer as well as inner race of the bearing is seen on physical inspection. On the other hand the new one is free from these types of defects. The given dimension should be as follows.

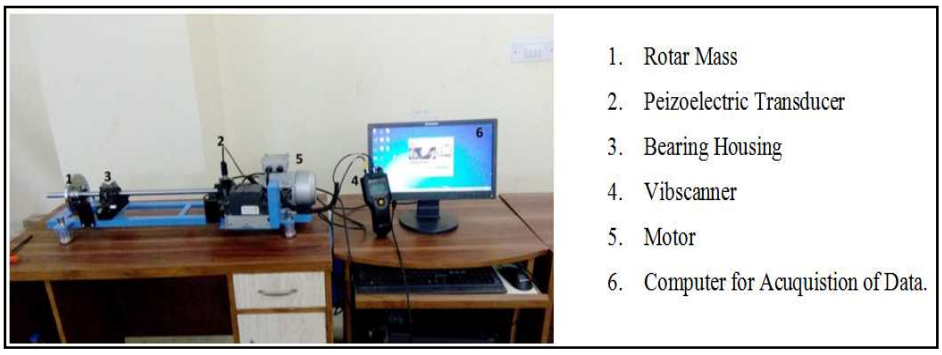

Figure 2

Table 1: Specification of Bearing

1	Inner diameter of the bearing	25 mm
2	Outer diameter of the bearing	52 mm
3	Width of the bearing	15 mm
4	Roller diameter	72 mm

Figure 3: Self-Align Roller Bearing.

The experiment is to find the vibration behavior of the self-align healthy bearing to the unhealthy bearing with defects like cracks. Self-adjusting metal rollers, for example, the Wing Quist bearing appeared in the image, are built with the internal ring and roller gathering is contained inside an external ring that has a circular raceway. This development enables the bearing to endure a little precise misalignment coming about because of shaft or lodging redirections or ill-advised mounting. The bearing was utilized fundamentally in bearing game plans with extremely long shafts, for example, transmission shafts in material factories. [6] One disadvantage of one self-adjusting metal rollers is a constrained burden rating, as the external raceway has exceptionally low endearment (sweep is a lot bigger than roller range). This prompted the development of the round roller bearing, which has a comparative structure, yet use rollers rather than rollers. Additionally, the round roller push bearing is a development that gets from the discoveries by Wing quist.

RESULTS AND DISCUSSIONS

In evolution and comparison between the two bearing [healthy and unhealthy] in the different parameters that is displacement spectrum, overall velocity and Mach.

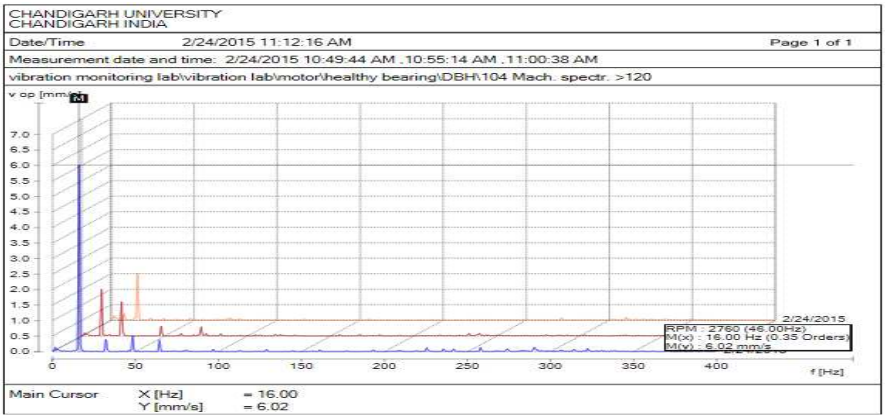

Figure 4

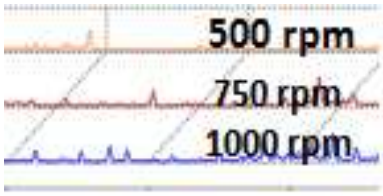

Figure 5: Mach Spectrum for Healthy Bearing at 500, 750 & 1000 rpm.

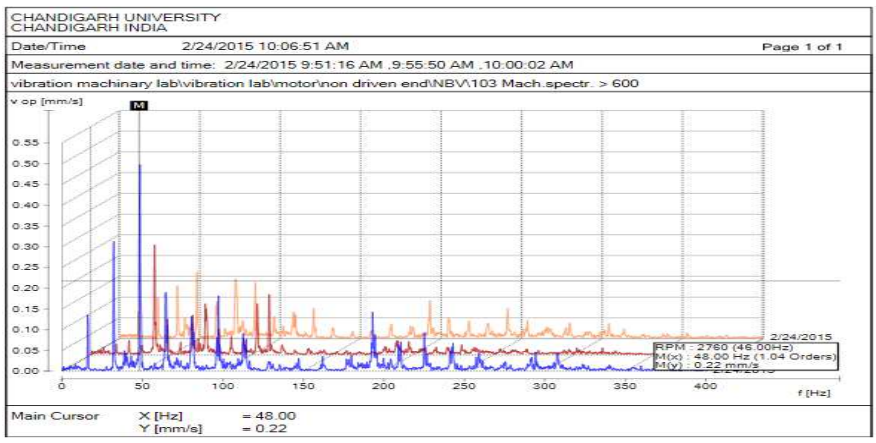

Figure 6: Mach Spectrum for Unhealthy Bearing at 500, 750 & 1000 rpm.

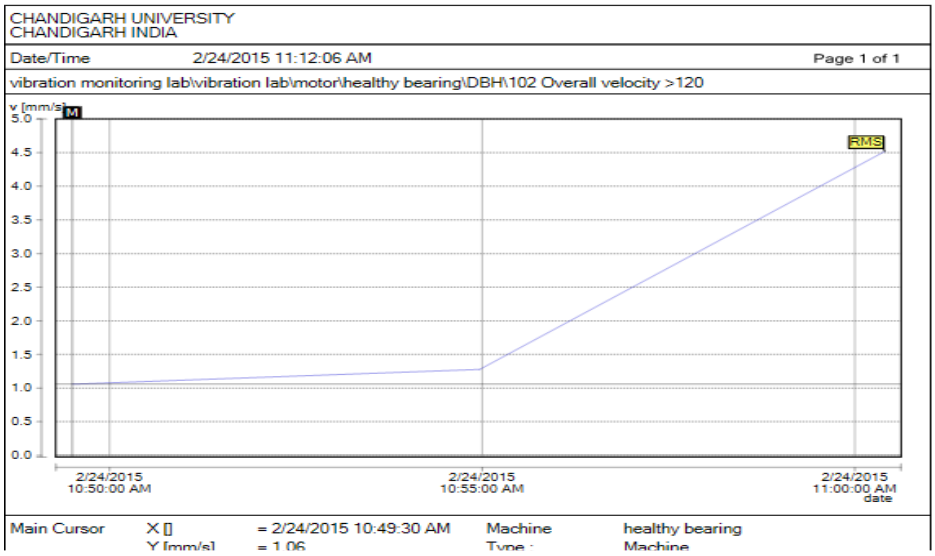

Figure 7: Overall Velocities for Unhealthy Bearing of 500, 750 & 1000 rpm.

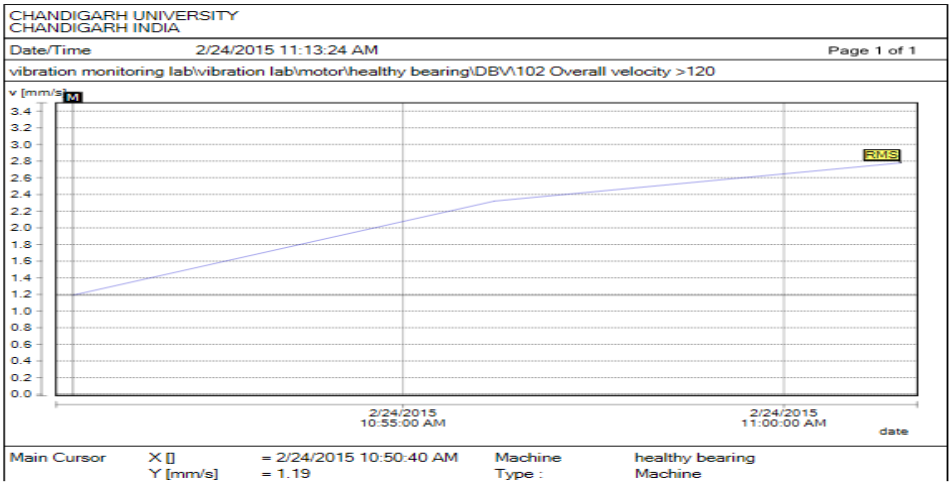

Figure 8: Overall Velocity for Healthy Bearing of 500, 750, 1000 rpm.

The above shown chart (4–6) demonstrate the Mach range motion for single line profound depression metal roller. It speaks about the variety of the vibration in recurrence space. The chart speaks about the vibrations' recurrence increments at rapid speed when contrasted with low speed in both sound and undesirable bearing. In addition, the recurrence of event of vibration in unfortunate bearing is more prominent than solid bearing. The most extreme estimation of variety for undesirable bearing is X=48 Hz, Y=0.22 mm/sec, and for solid bearing is X=16 Hz, Y= 6.02 mm/sec. So it is found from the above charts that the vibration speed for sound is quick when contrasted with unfortunate bearing and recurrence of event of vibration is lesser for undesirable bearing, however multiple times more for solid bearing.

The general speed of the bearing is the vibration speed of the bearing in mm/sec. The examination between the solid and undesirable orientation based on the general speed is made in over two charts. In over two diagrams it is seen that the general vibration speed increments with increase in speed and time. For sound bearing it is pictured that the general vibration for solid bearing is less and for unfortunate bearing it is exceptionally expansive. The estimation of general vibration speed is 1.19mm/sec for sound bearing and 1.06 mm/sec for unfortunate bearing.

CONCLUSIONS

The single column profound section roller bearing is utilized in present examination to speak about the conduct of the vibration flag. The vibration motions in the terms of the Mach range and generally speaking speed is established and thought about. From the above diagrams and results it is found that the vibration signs of the solid bearing are very surprising from the signs of the unfortunate bearing. The Mach range diagram speaks about the vibrations recurrence more at faster speed when contrasted with low speed and medium speed in both solid and undesirable bearing. Be that as it may, the recurrence of event of vibration in unfortunate bearing is higher than sound bearing. In above outcomes it is likewise demonstrated that the general vibration speed increments with increase in speed and time. For solid bearing it is pictured that the general vibration for sound bearing is low and for undesirable bearing is high.

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